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| 10/089,026 | 07/02/2002 | Pierre Siohan | F40.12-0005 | 9446 |

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| EXAMINER | |
|---|---|
| PHUNKULH, BOB A | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/089,026 | SIOHAN ET AL. | |
| | Examiner | Art Unit | |
| | BOB A. PHUNKULH | 2419 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *24 December 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-9, 11-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,8,9 and 11-21* is/are rejected.

7)☒ Claim(s) *5 and 7* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

This communication is in response to applicant's 12/24/2008 amendment(s)/response(s) in the application of **SIOHAN et al.** for "**METHOD FOR TRANSMITTING AN OFFSET MODULATED BIORTHOGONAL MULTICARRIER**" filed 03/26/2002. The amendment/response to the claims have been entered. No claim has been canceled. No claims have been added. Claims 1-9, 11-21 are now pending.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 6, 12, 15-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over *KOBER* et al. (US 6,252,535), hereinafter *KOBER*.

Regarding claim 1, *KOBER* discloses a method for transmitting a biorthogonal frequency division multiplex/offset modulation (BFDM/OM) biorthogonal multicarrier signal (intended used, therefore no patentable weight given) characterized in that it implements a transmultiplexer structure providing:

a modulation step, by a bank of synthesis filters (60a ...60n, see figure 4), the bank of filter having M parallel branches, M > 2, each fed by source data ($x_0(n)$ …$x_{M-1}(N)$, see figure 4) and each comprising an expander of order M and filtering means (see col. 5 lines 35-49); and

a demodulation step, by a bank of analysis filters (44a…44n, see figure 4), the bank of synthesis filters having M parallel branches, each comprising a decimator of order M (64a..64n, see figure 4) and filtering means, and delivering representative data received from the source data (col. 3 lines 7-12),

the synthesis filters and analysis filters being derived from a predetermined prototype modulation function (the analysis and synthesis filters can be implemented in any number of ways depending upon the type of signal to be filtered, see col. 2 lines 53-67).

*KOBER* fails to explicitly disclose that each of both branches of analysis and synthesis filters comprises of a decimator of order M and the expender of order M. In another word, the number of parallel branches is double the order of the expender or the decimator.

In col. 5 lines 34-50, *KOBER* discloses that the downsamplers performing M-fold decimation, taking every $M^{th}$ sample, and upsamplers performing sampling by filling zeros between each sample. Therefore, the subject matter "a decimator of order M" or “the expender of order M” is the sampling rate of the downsampler or the upsampler.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to adjust the sampling rate of the downsampler 64a...64n or upsamplers 68a…8n in order to customized to user's or system’s needs with inexpensive and simple converters.

Regarding claim 2, *KOBER* discloses in that the filtering means of the bank of synthesis filters and/or of the bank of analysis filters are grouped as a polyphase matrix, respectively (the analysis filters and synthesis filters are represented in a special form known as the Polyphase representation; see col. 3 lines 7-12; and col. 5 line 62 to col. 6 line 6).

Regarding claim 3, *KOBER* discloses at least one of the polyphase matrices comprises a reverse Fourier transform with 2M inputs and 2M outputs (a known transform, see col. 5 line 62 to col. 6 line 6).

Regarding claim 12, *KOBER* discloses a method for modulating a biorthogonal frequency division multiplex/offset modulation ('BFDM/OM) biorthogonal multicarrier signal, characterized in that it implements a bank of synthesis filters (60a ...60n, see figure 4), the bank of filter having M parallel branches, M > 2, each fed by source data ($x_0(n) \ldots x_{M-1}(N)$, see figure 4) and each comprising an expander of order M and filtering means (see col. 5 lines 35-49), which is derived from a predetermined prototype modulation function (the analysis and synthesis filters can be implemented in any number of ways depending upon the type of signal to be filtered, see col. 2 lines 53-67).

*KOBER* fails to explicitly disclose that each branches of analysis filters comprises of a decimator of order M and the expender of order M. In another word, the number of parallel branches is double the order of the expander or the decimator.

In col. 5 lines 34-50, *KOBER* discloses that the downsamplers performing M-fold decimation, taking every $M^{th}$ sample, and upsamplers performing sampling by filling zeros between each sample. Therefore, the subject matter "a decimator of order M" or “the expender of order M” is the sampling rate of the downsampler or the upsampler.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to adjust the sampling rate of the downsampler 64a...64n or upsamplers 68a…8n in order to customized to user's or system’s needs with inexpensive and simple converters.

Regarding claim 4, *KOBER* discloses it implements a reverse Fourier transform (a know transform) fed by 2M branches, themselves fed by the transmitted signal, and each comprising a decimator of order M followed by a filtering module, and feeding 2M phase shift multipliers, delivering an estimation of the source data (a known transform, see col. 5 line 62 to col. 6 line 6).

Regarding claim 15, *KOBER* discloses a method for demodulating a biorthogonal frequency division multiplex/offset modulation (BFDM/OM) biorthogonal multicarrier signal characterized in that it implements a bank of analysis filters (44a…44n, see figure 4), the bank of synthesis filters having M parallel branches, each comprising a decimator of order M (64a..64n, see figure 4) and filtering means, and delivering representative data received from the source data (col. 3 lines 7-12), the synthesis filters being derived from a predetermined prototype modulation function (the analysis

and synthesis filters can be implemented in any number of ways depending upon the type of signal to be filtered, see col. 2 lines 53-67).

*KOBER* fails to explicitly disclose that each of both branches of analysis and synthesis filters comprises of a decimator of order M and the expender of order M. In another word, the number of parallel branches is double the order of the expander or the decimator.

In col. 5 lines 34-50, *KOBER* discloses that the downsamplers performing M-fold decimation, taking every $M^{th}$ sample, and upsamplers performing sampling by filling zeros between each sample. Therefore, the subject matter "a decimator of order M" or “the expender of order M” is the sampling rate of the downsampler or the upsampler.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to adjust the sampling rate of the downsampler 64a...64n or upsamplers 68a…8n in order to customized to user's or system’s needs with inexpensive and simple converters.

Regarding claim 6, *KOBER* it implements a reverse Fourier transform (a know transform) fed by 2M branches, themselves fed by the transmitted signal, and each comprising a decimator of order M followed by a filtering module, and feeding 2M phase shift multipliers, delivering an estimation of the source data (a known transform, see col. 5 line 62 to col. 6 line 6).

Regarding claims 8 and 13, KOBER fails to discloses the filters are belong to group comprising: one of transverse structure filters, ladder structure filters, or trellis structure filters. Examiner takes official notice that grouping filters one of transverse structure filters, ladder structure filters, or trellis structure filters is well known in the art of filtering for providing efficient filtering means. Thus, at the time of the invention it would have been obvious to one of ordinary skill in the art to group the filters in KOBER as one of transverse structure filters, ladder structure filters, or trellis structure filters since such grouping of filters is well known in the art of filtering for providing efficient filtering means.

Regarding claim 16, *KOBER* discloses an apparatus comprising: a modulating device for modulating a biorthogonal frequency division multiplex/offset modulation (BFDM/OM) biorthogonal multicarrier signal, characterized by a bank of synthesis filters having 2M parallel branches, M _>2, each fed by source data and each comprising an expander of order M and filtering means, the filtering means being derived from a predetermined prototype modulation function (the analysis and synthesis filters can be implemented in any number of ways depending upon the type of signal to be filtered, see col. 2 lines 53-67).

*KOBER* fails to explicitly disclose that each of both branches of analysis and synthesis filters comprises of a decimator of order M and the expender of order M. In another word, the number of parallel branches is double the order of the expander or the decimator.

In col. 5 lines 34-50, *KOBER* discloses that the downsamplers performing M-fold decimation, taking every $M^{th}$ sample, and upsamplers performing sampling by filling zeros between each sample. Therefore, the subject matter "a decimator of order M" or “the expender of order M” is the sampling rate of the downsampler or the upsampler.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to adjust the sampling rate of the downsampler 64a...64n or upsamplers 68a…8n in order to customized to user's or system’s needs with inexpensive and simple converters.

Regarding claim 17, *KOBER* it implements a reverse Fourier transform (a know transform) fed by 2M branches, themselves fed by the transmitted signal, and each comprising a decimator of order M followed by a filtering module, and feeding 2M phase shift multipliers, delivering an estimation of the source data (a known transform, see col. 5 line 62 to col. 6 line 6).

Regarding claim 18, *KOBER* discloses a demodulation device for demodulating a BFDM/OM biorthogonal multicarrier signal characterized by:

a bank of analysis filters (44a…44n, see figure 4), the bank of synthesis filters having M parallel branches, each comprising a decimator of order M (64a..64n, see figure 4, col. 3 lines 7-12),

the analysis filters being derived from a predetermined prototype modulation function (the analysis and synthesis filters can be implemented in any number of ways depending upon the type of signal to be filtered, see col. 2 lines 53-67).

Regarding claim 20, *KOBER* discloses a demodulation device for demodulation a biorthogonal frequency division multiplex/offset modulation (BFDM/OM) biorthogonal multicarrier signal comprising:

a bank of analysis filters (44a…44n, see figure 4), the bank of synthesis filters having M parallel branches, each comprising a decimator of order M (64a..64n, see figure 4, col. 3 lines 7-12),

the analysis filters being derived from a predetermined prototype modulation function (the analysis and synthesis filters can be implemented in any number of ways depending upon the type of signal to be filtered, see col. 2 lines 53-67).

*KOBER* fails to explicitly disclose that each branches of analysis filters comprises of a decimator of order M and the expender of order M. In another word, the number of parallel branches is double the order of the expander or the decimator.

In col. 5 lines 34-50, *KOBER* discloses that the downsamplers performing M-fold decimation, taking every $M^{th}$ sample, and upsamplers performing sampling by filling zeros between each sample. Therefore, the subject matter "a decimator of order M" or “the expender of order M” is the sampling rate of the downsampler or the upsampler.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to adjust the sampling rate of the downsampler

64a...64n or upsamplers 68a…8n in order to customized to user's or system’s needs with inexpensive and simple converters.

Regarding claims 19, 21, *KOBER* it implements a reverse Fourier transform (a know transform) fed by 2M branches, themselves fed by the transmitted signal, and each comprising a decimator of order M followed by a filtering module, and feeding 2M phase shift multipliers, delivering an estimation of the source data (a known transform, see col. 5 line 62 to col. 6 line 6).

Claims 9, 11, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over *KOBER* in view of Applicant's Admitted Prior Art (AAPA).

Regarding claims 9, 11 and 14, *KOBER* fails to disclose the signal is an OFDM/OM signal.

AAPA discloses that it is well known in the art that OFDM/OM has the advantage of "operat[ing] without any guard interval and also provid[ing] a wider possibility of choice as regards the prototype function" (e.g., see applicant's specification at page 2, lines 8-18). Thus, at the time of the invention it would have been obvious to one of ordinary skill in the art to implement an OFDM/OM signal in *KOBER* in order to provide the well known advantage of "'operat[ing] without any guard interval and also provid[ing] a wider possibility of choice as regards the prototype function" (e.g., see applicant's specification at page 2, lines 8-18).

***Allowable Subject Matter***

Claims 5, 7, are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

## ***Response to Arguments***

Applicant's arguments filed 12/24/2008 have been fully considered but they are not persuasive.

In response to the applicant's argument in pages 11-12, *KOBER* discloses the following in col. 5 lines 34-50:

> In a preferred configuration shown in FIG. 4, the signal 40 is decomposed by the analysis filter bank 46 (which includes analog or digital analysis filters $H_k$ (z) 44a-n) into subband signals which are each sampled by a downsampler 64a-n performing an M-fold decimation (i.e., taking every $M^{th}$ sample), and the sampled subband signals are further sampled after signal processing by an up-sampler 68a-n (and/or expander (which fills in L-1 zeros in between each sample)) and the further sampled subband signals are combined by a synthesis filter bank 62 (that includes analog or digital synthesis filters $G_k$ (z) 60a-n). The sampled subband signals, denoted by $x_o$ (n), $x_1$ (n), . . . $x_{m-1}$ (n), are the outputs of the N-band analysis filter bank and the inputs to the N-band synthesis filter bank. As a result of decimation, the subband signals are 1/N the rate of the input rate of the signal 40.

In col. 2 lines 35-52, *KOBER* further discloses the following:

> In a particularly preferred application, the signal processing step (b) includes either analog-to-digital or digital-to-analog conversions. The use of signal segments rather than the entire signal for such conversions permits the use of a lower sampling rate to retain substantially all of the information present in the source signal. According to the Bandpass Sampling Theorem, the sampling frequency of the source signal should be at least twice the bandwidth of the source signal to maintain a high fidelity. The ability to use a lower sampling frequency for each of the signal segments while maintaining a high fidelity permits the use of a converter for each signal segment that is operating at a relatively slow rate. Accordingly, a plurality of relatively inexpensive and simple converters operating at relatively slow rates can be utilized to achieve the same rate of conversion as a single relatively high speed converter converting the entire signal with little, if any, compromise in fidelity.

As cited in col. 5 lines 34-50, performing the M-fold decimation corresponds to taking every $M^{th}$ sample –thus the order of decimator corresponds to downsampling

rate. In col. 2 lines 35-52, a plurality of converters operating in low sampling rate can be utilized to achieve relatively inexpensive and simple analog-to-digital or digital-to-analog converters with the same result with a single relatively high speed converter. Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to adjust the sampling rate of the downsampler 64a...64n or upsamplers 68a…8n in order to customized to user's or system’s needs with inexpensive and simple converters.

## *Conclusion*

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

**Any response to this action should be mailed to:**

The following address mail to be delivered by the United States Postal Service (USPS) only:

Mail Stop ______________

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

**or faxed to:**

(571) 273-8300, (for formal communications intended for entry)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Bob A. Phunkulh** whose telephone number is **(571) 272-3083.** The examiner can normally be reached on Monday-Thursday from 8:00 A.M. to 5:00 P.M. (first week of the bi-week) and Monday-Friday (for second week of the bi-week).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor **Chirag G. Shah**, can be reach on **(571) 272-3144.** The fax phone number for this group is **(571) 273-8300.**

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/BOB A PHUNKULH/
Primary Examiner, Art Unit 2419